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American POTATO JOURNAL

Volume 26 *March, 1949* *Number 3*

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Entered as second class matter at New Brunswick, N. J., March 14, 1942, under Act of March 3, 1879.

Accepted for mailing at special rate of postage provided for in section 412, Act of February 28, 1925, authorized on March 14, 1928.

EFFECT OF TYPES OF CONTAINER, STORAGE AND VARIETY ON SHRINKAGE OF STORED POTATOES[1]

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The trend in retail marketing of potatoes recently has been an increase in the use of consumer packages. Approximately one-half of the potatoes handled by large chain stores are now sold in this form. Although most of these consumer packages consist of paper, such other forms as saxolin, cotton and burlap are also used. The effect of type of container on light injury and loss of weight in storage has had comparatively little study. In cases where packaged potatoes are held several weeks under warm store or warehouse conditions, weight loss due to sprouting or moisture loss may be important. Alban and Tussing (1) stored Katahdin potatoes in paper and in net bags in cold storage (35 to 45° F) and at room temperature and determined the comparative weight losses after one, four, eight, and twelve weeks. For these storage periods, the losses at room temperature were 1.2, 3.2, 6.4 and

[1]Published as paper No. 313, Department of Vegetable Crops, Cornell University, Ithaca, N. Y.

[2]Containers used in this experiment were furnished by Chase Bag Co., Buffalo, N. Y.

11.0 per cent, respectively. Losses at room temperature were two to three times higher than those subjected to cold storage. These losses were slightly less for paper bags than for net bags, the difference being 1.3 per cent in cold storage, 2.6 per cent at room temperature.

Objectives and Plan of Experiment

Although the most common type of retail store package is the two-walled, wet strength paper bag, various types of net bags, cotton and burlap are also used. The principal object of this preliminary study was to measure the effect of type of container on both moisture loss and weight of sprouts of potatoes stored under various storage environments. Two varieties packed and stored in six types of containers were held in three distinct types of storage over a period of 129 days or from the 4th of November to the 12th of March. The varieties were Sebago and Houma, the former being notably a poor keeper with prominent tuber lenticels; and the latter a good keeper with inconspicuous lenticels. Five types of package containers and the half-bushel slatted crate were used to test their influence on weight loss in storage. The three types of storage consisted of a refrigerated or controlled temperature storage, a house cellar of low relative humidity, and an insulated bank storage of fairly high relative humidity. The temperature and humidity condi-

Fig. 1. Containers used in Potato Storage Experiment. Left to right: 1. Crate. 2. Saxolin. 3. Chasenet. 4. Paper. 5. Cotton. 6. Burlap.

tions of each of the three types of storage are indicated in table 2. In setting up the experiment, 12 pounds net weight of potatoes were placed in each container, the bags being tightly tied and so placed in storage that there was free air space around each sample. Although temperature and humidity readings were made at weekly intervals, no sample weighings to determine periodic weight losses were made until the experiment was terminated. At the end of the experiment, the samples were first weighed to determine moisture loss, after which they were desprouted and the sprouts, if any, weighed to determine weight loss due to sprouting. The containers listed in table 1 are illustrated in figure 1.

Results

The effect of storage container on shrinkage due to moisture loss and to sprouting is indicated in table 1. These data represent the average for both varieties and three storages. Although the average moisture loss was least for the burlap container, this difference is not significant. Contrary to the results reported by Alban and Tussing (1946), the shrinkage loss from the paper bag was not less than that for the net bags either in terms of moisture loss or sprouting. Actually, there was no significant difference in weight loss in terms of either moisture or sprouting due to type of container.

Table 1.—*Relation of storage container to shrinkage (Average of 2 varieties in 3 storages)*

Container	Percentage Loss in Weight		
	Moisture	Sprouting	Total
1. Crate	4.68	1.04	5.72
2. Saxolin	4.43	1.39	5.82
3. Chasenet	4.16	1.91	6.07
4. Paper	4.34	1.39	5.73
5. Cotton	4.34	1.13	5.47
6. Burlap	2.69	1.56	4.25
Average	4.11	1.40	5.51

That potato sprout development is directly related to storage temperature is well known. It is also well known that 40° F. is the threshold temperature for sprout development in storage. These facts are

substantiated by the data on loss due to sprouting in each of the three storages as shown in table 2. Shrinkage due to sprouting varied directly with temperature, there being no sprout growth in either variety at the 40° F. level. Apparently temperature was more influential on sprout growth than was humidity. Also, somewhat contrary to prevalent opinion, Sebago showed no significantly greater tendency to sprout than did Houma under the conditions of this experiment.

Shrinkage caused by moisture loss averaged more than double in Sebago that of Houma and was significantly highest in the house cellar or low humidity storage. The greater moisture loss from Sebago may well be due to a higher transpiration rate associated with the large prominent tuber lenticels characteristic of this variety. There is also in these data an indication that humidity is more influential on shrinkage caused by moisture loss or transpiration than is temperature.

TABLE 2.—*Relation of type of storage and variety of weight shrinkage. (Average of 6 types of containers)*

Storage	Variety	Moisture Loss Per cent	Sprout Weight Loss Per cent	Total Loss Per cent
Refrigerated	Sebago	4.34	1.13	5.47
52° F.	Houma	2.60	1.39	3.99
75 per cent humidity	Total	6.94	2.52	9.46
House Cellar	Sebago	7.90	0.28	8.18
48° F.	Houma	2.77	0.00	2.77
35 per cent humidity	Total	10.67	0.28	10.95
Bank Storage	Sebago	5.12	0.00	5.12
40° F.	Houma	1.91	0.00	1.91
65 per cent humidity	Total	7.03	0.00	7.03
Average	Sebago	5.79	0.47	6.26
	Houma	2.43	0.46	2.89

CONCLUSIONS

Three factors were studied in this experiment to test their relation to shrinkage of potatoes in storage. These factors are storage container, variety and type of storage. Six types of containers were used; two varieties to wit, Sebago and Houma; and three storages, namely a re-

frigerated storage temperature 52° F. and 75 per cent relative humidity), a house cellar (temperature 48° F. and 35 per cent relative humidity) and and insulated bank storage (40° F. and 65 per cent relative humidity). The test involved the use of 36 twelve-pound lots of potatoes. Since no replicates were used, the data are not analyzed for significance. However, all data presented are the result of averaging a number of samples and consistency of data is considered in the conclusions drawn.

The following conclusions seem to be justified from the data presented in tables 1 and 2. (1) At the end of 4 months (129 days) of storage of two varieties in three storages, the weight shrinkage was not significantly different for 5 types of closed containers and the open slatted potato crate. (2) Of a total shrinkage of 5.51 per cent (table 1) for 4 months of storage, 75 per cent was caused by moisture loss, 25 per cent to sprouting; (3) Shrinkage due to sprouting was primarily a function of temperature whereas shrinkage due to transpiration was primarily a function of relative humidity; (4) Contrary to prevalent opinion, the Sebago variety showed no greater tendency to develop storage sprouts than Houma: (5) the Sebago variety showed an approximately 60 per cent greater weight loss from transpiration than did the variety Houma. This difference may be due to the larger, more prominent lenticels characteristic of Sebago.

Literature Cited

1. Alban, E. K. and E. B. Tussing. 1946. Weight loss of potatoes stored in various containers. Amer. Potato Jour. 23: 302-304.

EFFECT OF DRIFT OF 2, 4-D SPRAY ON IRISH POTATOES

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A new problem has become apparent in the small grain areas of South Dakota and Nebraska where potatoes are common in rotation. While inspecting potatoes grown for certification in these areas in the summer of 1948, the writer noticed several fields of potatoes showing slight to severe injury from 2, 4-D that had been applied to control weeds in nearby fields of small grains and flax. The most common rate of application was ½ lb. of 2, 4-D acid per acre, but continued drifting during the spraying operations may undoubtedly increase that rate considerably.

Thompson and Shuel[3] using 1.2 pounds per A. of free acid in the 2, 4-D spray upon Katahdins at four weeks from maturity found no detrimental effects whereas upon Cobblers at two weeks from maturity, severe chlorosis was observed with no indication of recovery. Bradley and Ellis[3] using ½, ¼, ¾ and 1 lb. acid per acre, respectively upon the variety Katahdin, found little effect upon the vines except at the 1-lb. rate and this was not very severe. Ennis *et. al.*[2] using 1g. 2, 4-D acid per sq. yd. on Irish potatoes in the early bud stage found that the yield was reduced to 27 per cent compared with that of the untreated check. No results of experiments with 2, 4-D applied to the varieties Triumph and Warba were found in the literature.

Bliss Triumph and Warba Irish Potato plants appeared rather susceptible to injury by 2, 4-D. Affected leaflets darkened slightly and were smaller and more sharply pointed than were healthy leaflets. However, the most striking characteristic was the abundance of small raised areas on the leaflets. The immature leaflets were the most susceptible, and they frequently ceased growing following contact with the spray material. If the plants were quite young (below eight inches in height) they often recovered and put out new leaves. More nearly mature plants receiving the spray ceased growth almost entirely.

A 16-acre field of Triumph potatoes lying south and adjacent to a recently sprayed oat field afforded a good example of injury to plants sprayed when in the early blossom stage. When observed a week after the spray drift, 2, 4-D injury was pronounced. Leaflets were small, dark, and "knobby"; the stems were a dark red to green-red in color.

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[1]Associate Professor of Botany.

The shape of the field was almost square. The 2, 4-D spray had drifted about 200 yards across the field in such abundance that injury at the side most distant from the sprayed oat field was almost as severe as that adjacent to it.

This field of potatoes was planted on the 25th of April and harvested on the 8th and 9th of September. Another 16-acre field, about one mile away was planted from the same lot of seed on the 28th of April and harvested from the 11th-13th of September. The "injured" field was the more fertile of the two, according to the grower. The number of tubers on the plants was approximately the same in each field, but the tubers in the injured field were considerably smaller. The vines in the injured field did not die earlier than those in the "uninjured" field, but there was no apparent growth after the spray drift period. The yields of potatoes were 128 bushels per acre from the injured field and 158 from the uninjured. This represents a decrease in yield of approximately 20 per cent, but, because of the smaller tubers from the injured field, the actual decrease in No. 1 potatoes was undoubtedly greater.

Other fields of potatoes including Warbas affected by the drift of 2, 4-D were observed, but though damage was obvious it was not so severe as that described above. It is apparent that growers planning to use 2, 4-D for weed control must take into consideration the possibility of drift of the material to fields of susceptible plants.

Literature Cited

1. Bradley, R. H. and Ellis N. K. 1948. Amer. Potato Jour. 25, (3) 87-89.
2. Ennis, W. B.; Swanson, C. P.; Allard, R. W. and Boyd, F. T. 1946. Effects of certain growth-regulating compounds on Irish potatoes. Bot. Gaz. 107:568-574.
3. Thompson, W. R. and Shuel R. W. 1948. Amer. Potato Jour. Vol. 25 (5) 163-171.

A REPORT ON SUN-DRYING OF POTATOES FOR STOCK FEED IN NEBRASKA*

EARL P. BARRIOS[1]

Department of Agriculture, State of Nebraska, Scottsbluff, Nebr.

The Nebraska Potato Development Division Advisory committee, at a meeting in Gibbon on the 3rd of August 1948, voted to sponsor a project for natural, or sun-drying, of surplus and cull potatoes from the 1948 central Nebraska crop. There seemed ample justification for expenditure of money for this type of work, as a guide to determine the practicability of large-scale sun-drying, and the value of such a product as feed for livestock. Both artificially and naturally dehydrated potatoes have proved comparable to corn in feeding tests at various Experiment Stations, including the Scottsbluff Farm, (1) but no extensive project of this type had as yet been conducted in the state.

In July, the Animal Husbandry department of the Nebraska College of Agriculture, under the supervision of Dr. Marvel Baker, obtained a truckload of potatoes through the Production and Marketing Administration, for sun-drying experiments. This preliminary test showed that when tubers were cut into slices from one-eighth to one-quarter inch thick and spread on a cement strip in layers up to three inches deep they dried to ten or eleven per cent moisture content within four days. This moisture content is about equal to that of corn, and an analysis of the protein, nitrogen-free extract, fat, ash, and fiber percentage showed a similar correlation. (See table 1.)

Following the test at Lincoln, an agreement was signed, jointly, by the College of Agriculture, the Production and Marketing Administration, and the Potato Development Division to obtain up to five carloads (360 sacks per car) of surplus potatoes, U. S. No. 2, or U. S. No. 1 Size B grades from the central Nebraska crop. No charge was to be made for the potatoes, washed, graded, and in new sacks, but transportation was to be paid the shipper. This cost was ultimately taken care of by returning the sacks to the shipper from whom the potatoes were obtained. The Peterson Potato Company and the Herbert Campbell Company supplied all potatoes used in the project, trucking them to the drying site from Gibbon, Shelton, and Wood River Nebraska.

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[1]Chief, Division of Potato Development.

Through the efforts of the Chamber of Commerce and city officials of Grand Island, Nebraska, 140,000 square feet of oil-mat area at the Grand Island airport was obtained. The problem of securing a machine which would slice the potatoes in a reasonable length of time, without crushing, was solved by the offer of a David Bradley ensilage cutter from the local Sears-Roebuck farm store. The fans were removed from the knife wheel, leaving only the knives on the wheel. The bottom half of the wheel housing was removed, and covered with wire netting, in order that the sliced potatoes would fall instead of being blown upwards, as would have been the case if the fans were attached to the knife wheel.

The ensilage cutter was mounted on a loading dock near the drying strip, with the wheel housing extending over the edge of the platform. Manure spreaders were backed under the dock, and sliced potatoes fell into the machines, to be placed on the oil-mat area for drying. Tractor power, at idling speed, proved most satisfactory for operating the ensilage cutter, with a knife speed of 175 RPM providing more uniform slices one-quarter inch thick. The speed at which the potatoes were fed into the machine also governed the uniformity of slicing. Best results were obtained at the above-mentioned RPM with potatoes going through the machine at the rate of 65 sacks per hour. Faster operations resulted in poor uniformity, many slices being too thick for proper drying.

Manure spreaders proved ideal for scattering the sliced potatoes at an even depth on the drying strip, in this case about one inch. At the beginning of the spread it was necessary to level the pile by hand raking, but the labor involved was negligible. The depth of spread was dependent on the speed at which the spreader operated, slow speeds proving less satisfactory than a moderate, or faster rate. All tractor and spreader equipment, as well as labor, was supplied by Elmer Petersen and Richard Youst, of the Grand Island Potato Company, and by the City of Grand Island.

TABLE 1.—*Chemical analyses of sun-dried potatoes and corn*

Product	Moisture Per cent	Protein Per cent	Fat Per cent	Ash Per cent	Crude Fiber Per cent	Nitrogen-Free Extract Per cent
Dried Potatoes	9.0	8.7	0.7	4.3	2.0	75.2
Corn	10.8	10.1	3.9	2.3	2.0	70.9

The first sliced potatoes were placed on the drying area on the 18th of August, and stirred once a day with a hayrake, which was sufficient to permit air and light to reach all portions of the piles. All potatoes that were spread the first day were dry by the afternoon of the 21st, whereas later spreads made on the 19th and 20th of August were dry by the evening of the 23rd. Weather conditions during the entire period were ideal, with Grand Island reporting a temperature range of 70 to 102 degrees, and no precipitation.

On the 24th of August the dried potatoes were swept into windrows with a motor-driven street sweeper, supplied by Peter Kewit and Sons, of Grand Island. This method of piling the feed proved very satisfactory, but some foreign material accumulated with the potatoes. A cleaner area, such as a cement strip, would be more desirable in future operations of this type. However, the motor-driven sweeper was very economical, taking only two hours to pile the entire amount of feed on the area into five windrows. The potatoes were then loaded into a truck by means of scoop shovels and hand labor, this operation taking only three-and-one-half hours and representing most of the non-mechanized labor involved in the drying process.

A total of one thousand sacks of potatoes was sliced and spread on the drying area, which, from previous results, should have yielded between five and ten tons of stock feed. The cost of the project averaged about seventy-five dollars per carload of 360 sacks, and the resulting feed was delivered to the Animal Husbandry Department of the College of Agriculture, in a truck furnished by them, for experimental feeding to their herd. Results of the feeding value will be forthcoming soon.

A breakdown of the cost involved shows that, excluding the price of the potatoes, this feed was produced for $4.50 per ton of fresh potatoes. The Production and Marketing Administration paid fifty per cent of the U. S. No. 1 support price, or $1.27½, for these potatoes, and at that figure the feed could be produced commercially for about $30.00 a ton, if handled in a similar manner, or less, if cull and pickout potatoes were fed on the farm where grown.

Nebraska, being a large stock-producing, as well as potato-growing state, is in a more favorable position to utilize the cull and surplus potatoes from its crop in this manner than most areas. Many large potato-producing sections raise little livestocks, or *vice versa,* and potato feed would have to be imported, with transportation charges increasing the cost. The opportunity to produce high-quality stock feed, at low cost, exists in the state at present. This should become a

part of the regular farm program, annually, with all cull and surplus potatoes fed to livestock on the farm where the potatoes are produced.

Literature Cited

1. Harris, L., and M. A. Alexander. 1946. Utilizing dried potatoes in lamb fattening rations. Nebr. Agr. Exp. Sta. Sheep Circular 346.

FIVE YEARS OF BACTFRIAL RING ROT

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Each year since 1943 an annual survey has been made of table stock potatoes on Ontario farms by the Provincial Department of Agriculture as a part of their program for the control of bacterial ring rot. In every case where the presence of ring rot was suspected, specimens were submitted to either the Ottawa or the St. Catharines laboratory of the Division of Botany and Plant Pathology, Dominion Department of Agriculture, for confirmation by microscopic examination.

With the fifth of these surveys now completed, it seems to be an opportune time to take stock of the situation and assess the value of these annual surveys. We have in our files a record of every case of bacterial ring rot reported from 1943 to 1947. Through an analysis of these data we have derived some interesting information concerning the prevalence, persistence and spread of bacterial ring rot in this province.

In the five-year period, bacterial ring rot was reported on a total of 1,630 farms. On 1,310 of these farms (81 per cent) it was reported in one year only. Ring rot was found on 268 farms twice, on 52 farms three times, and on 3 farms four times in the five years. Thus a total of 320 farms had ring rot more than once in this period.

The question is often asked: "Is bacterial ring rot increasing in this province?" In order to answer this question, let us take the reports year by year, as summarized in table 1.

*Contribution No. 931 from the Division of Botany and Plant Pathology, Science Service, Department of Agriculture, Ottawa Canada.

TABLE 1.—*Number of farms and approximate acreage infested with bacterial ring rot as revealed by annual surveys 1943 to 1947 inclusive.*

	Individual Farms			Approximate Total Acreage		
Year of Survey	Number Inspected	Number Infested	Percentage Infested	Number of Acreage Inspected	No. of Acres Infested	Percentage Infested
1943	902	157	17	10,000	1,200	12
1944	3,000	463	15	30,000	2,800	9
1945	3,300	281	9	31,000	1,200	4
1946	3,200	673	21	31,000	3,640	12
1947	3,100	351	11	30,000	1,900	6

In 1943, 902 farms were inspected and 157 (17 per cent) were found to be infested. On an acreage basis this represented approximately 1,200 acres (12 per cent) of 10,000 acres inspected.

In 1944, approximately 3,000 farms were inspected, and 463 (15 per cent) were found to be infested. This represented approximately 2,800 acres (9 per cent) of 30,000 acres inspected.

In 1945, approximately 3,300 farms were inspected, and 281 (9 per cent) were infested. This represented approximately 1,200 acres (4 per cent) of 31,000 acres inspected.

In 1946, 3,200 farms were inspected and 673 (21 per cent) were found to be infested. This represented approximately 3,640 acres (12 per cent) of 31,000 acres inspected.

In 1947, 3,100 farms were inspected and 351 (11 per cent) found to be infested. This represented approximately 1,900 acres, (6 per cent) of 30,000 acres inspected.

Although the number of positive cases reported per year has increased since the first year of the survey, it will be seen from these data that this does not represent an increase in the prevalence of the disease but is the result of more comprehensive surveys covering larger numbers of farms over a wider territory. With the exception of the 1946 season, the percentage of infested farms has decreased since the first survey. The data given on an acreage basis reflect the same trend.

Not only has there been a reduction in the number of infested farms, but there has been a corresponding reduction in the amount of the crops infected on these farms. In the early years of the survey, inspectors reported finding as high as 60 per cent of the plants in some fields infected with ring rot. In 1947 they found low rates of infection — often only a trace — on the majority of the fields inspected. This meant a big increase in the yield of marketable tubers suitable for table stock purposes from farms where ring rot was present.

Another question that can be answered from our experience of the past five years is this: "How effectively is bacterial ring rot being controlled?" As with practically all of our plant diseases, control of ring rot depends on prevention rather than cure. The control measures that we have advocated are as follows:

1. If even a trace of ring rot appears on the farm, dispose of *all* potatoes grown there that season.
2. Disinfect storages, cellars, bins, barrels, etc., with bluestone, formalin or lysol.

3. Disinfect tools, planters, diggers, graders, etc. with formalin or lysol. If such equipment has been used on another farm, disinfect it before using it on your own.
4. Disinfect bags, gloves, etc. with formalin.
5. Buy *certified* seed potatoes for planting next season, *Never plant table stock potatoes.*

If these precautions are followed faithfully, ring rot can be eliminated from any farm in one season. It is fortunate that the causal organism does not live over winter in the soil; however, it is wise to rotate crops to eliminate volunteer plants growing from tubers left in the ground.

Let us look over the records again to see how effectively the growers have checked ring rot after having it on their farms. For this purpose we have followed each case through to the third year from the original infection. The reason for this is that ring rot may not be found the first year after a clean-up, yet re-appear the following year. This suggests that the clean-up was not 100 per cent effective and that a trace of disease, though not detected, was carried through the next season and multiplied so that it was apparent again the third year. If more than one year elapses between the appearances of ring rot, we assume that the crop has become re-infected from some other source.

Whereas of the 157 farms that had ring rot in 1943, 134 were apparently free in 1944, 23 (15 per cent) remained infested. In 1945, 3 farms were still infested while 9 that were apparently free the previous year had it again. Thus a total of 12 farms (8 per cent) had ring rot the third year.

Whereas of 463 farms that had ring rot in 1944, 425 were apparently free in 1945, 38 (8 per cent) had it again. In 1946, 13 farms were still infested while 65 that were apparently free the previous year showed the presence again. Thus a total of 78 farms (17 per cent) had ring rot the third year.

Of 281 farms that were infested with ring rot in 1945, 220 were apparently free in 1946, while 61 (22 per cent) had it again. In 1947, 12 farms were still infested while 17 that were apparently free the previous year had it again. Thus a total of 29 farms (10 per cent) had ring rot the third year.

Of 673 farms that had ring rot in 1946, 607 were apparently free in 1947 while 66 farms (10 per cent) had it again.

In 1947 ring rot was found on 351 farms. Of these 265 had it for the first time in the five-year period.

These records indicate that, again with the exception of the 1946 season, an increasing number of growers have been successful in eliminating ring rot from their farms in one year. There is no reason why the other growers could not do the same. The number of farms infested with ring rot the second year is still too high; the number having it beyond the second year is inexcusable.

In all respects 1946 was a peak year, and the situation revealed by the survey was discouraging. The highest number and percentage of infested farms were reported in 1946, and these included the highest proportions of both first and second year repeat cases. However, we must bear in mind that the disease that appears in the crop of any given season comes almost entirely from infected seed produced the previous season. It is not evident what factors contributed to this build-up of infection in 1946.

Finally, let us consider the question: "Is the ring rot survey worth-while?" The purpose of the survey is two-fold: to provide information on the prevalence and distribution of ring rot year by year, and to bring it to the attention of the growers wherever it is found, so that they can take steps to control it. As indicated in the foregoing discussion, losses due to ring rot have been materially reduced because fewer farms were infested and through lower rates of infection. The cost of the survey is negligible in comparison with the direct benefits to the producers.

In support of the annual surveys some interesting cases may be cited. For example in Carleton County ring rot was found on 9 farms in the 1944 survey. Due to unavoidable circumstances, no survey of this county was conducted in 1945. When the next survey was conducted, in 1946, ring rot was found on 44 farms and high rates of infection were reported in many cases. In 1947 ring rot was found on only 6 farms in this county (although the conditions for inspection were admittedly not good.)

Outstanding success in eradicating ring rot has been revealed by the survey in certain districts. For example, ring rot was found on 22 farms in Wentworth County in 1946. An intensive survey in 1947 failed to reveal a single positive case in that county. Other districts have equally good records.

To sum up our observations we may say that, on the whole, the results of the surveys have been encouraging, and that the outlook for ring rot control in Ontario is bright. Nevertheless, we must not relax our vigilance — every potato grower must be on his guard against this destructive disease.

ABSTRACTS OF PAPERS PRESENTED AT THE ANNUAL MEETING OF THE POTATO ASSOCIATION OF AMERICA, PITTSBURGH, PA., DECEMBER 6, 7, AND 8, 1948

Spraying potatoes for the control of diseases and insects in Maine. REINER BONDE. The neutral copper and organic spray fungicides, when combined with DDT have for the past four years given higher yields of potatoes than has Bordeaux with DDT. The latter in contrast gave the best control of late blight. The greater yields received with some zinc-containing fungicides in comparison with copper fungicides did not appear to be due to zinc stimulation but to being less injurious to the potato foliage. DDT when combined with any fungicide increased both the fungicidal and insecticidal value of the spray mixture.

The percentage of metallic copper in a dust fungicide affected the yield rate and the control of late blight less than did the time of application and the coverage of the foliage. Talc combination dusts containing only four and five per cent metallic copper gave good control of the diseases when properly applied. Good control of insects and diseases and high yields were secured with Copper-Lime-DDT dust mixtures provided they were used soon after they had been prepared.

The loss to the potato crop from injury caused by the wheels of the sprayer or duster was from 23 to 40 bushels per acre or from 5.1 to 8.6 per cent of the crop, depending on the length of the boom.

"Sprout inhibition of non-dormant Chippewa potatoes." R. H. BRADELY and LESLIE L. DEAN. Satisfactory sprout inhibition on non-dormant Indiana-grown Chippewa potatoes was achieved by the use of certain growth-regulating materials. Compounds used were the sodium salt of beta-naphthoxyacetic acid, sodium salt of naphthaleneacetic acid, naphthaleneacetic acid, methyl ester of beta-napthoxyacetic acid, and methyl ester of alpha-naphthaleneacetic acid. The experiment was designed to exhibit the effects of three concentrations, 1, 3 and 9 grams of growth regulator per bushel of potatoes, as well as three methods of application,—dusted, dipped and dried at 70° F., and dipped and dried at 135° F. The data indicate that greater concentrations of growth regulators are required to inhibit sprouting after dormancy is broken.

Some effects of restricting the oxygen supplied to potato roots. JOHN BUSHNELL. Plants grown in gravel culture in jars with the tops sealed off with soft paraffine were supplied with air diluted with nitrogen to reduce the oxygen in the mixture to 15, 10 and 5 per cent. The roots were able to use oxygen at the lowest concentration. The reduction in oxygen reduced the growth of the main stem, the leaflets and the tubers,

but stimulated the growth of branches, while having very little effect on the roots. It also increased the proportion of dry matter in the tops as a whole. The volume of oxygen consumed by roots of young plants was approximately three times the volume of the water absorbed.

Potato vine killing in Prince Edward Island. L. C. CALLBECK. Killing potato vines prior to harvesting the crop is a practice that has been widely developed and adopted in recent years but the root idea goes back many years. In 1887 Jensen suggested leaving the crop in the ground until two weeks after the tops were dead as a sanitary measure against late blight tuber rot, and his theories were substantiated by the experiments of several workers on this continent. Paul A. Murphy, working in Prince Edward Island during the First World War, proposed cutting and removing the vines or spraying them with a chemical such as sodium arsenite or cupric sulphate. His advice was accepted by many growers in the province where killing the vines has not been an unusual procedure since Murphy's time. No investigational work was undertaken by subsequent workers until 1941 when tests to find a more effective killer were initiated.

A discoloration at the stem end and in the vascular system of tubers may be induced by killing the vines by either chemical or physical agencies, and in some regions this phenomenon is regarded in a serious light. The factor or combination of factors that may be correlated with the discoloration has not been satisfactorily determined. It is probable that more than one factor plays a part in inducing discoloration. These may include: (1) the rapidity of the kill, (2) the type of chemical, (3) the character of the season, and (4) the age of the plants.

In Prince Edward Island it has been observed that the severity of the tuber discoloration is greater when the plants are killed down rapidly and that dinitro compounds are the chief offenders. Drought also seems to favor the reaction. Experiments conducted during the past two seasons have indicated that the amount and intensity of discoloration in tubers from plants killed at different stages of development with Dowspray 66 Improved increases quite uniformly with the age of the plants. Those killed late in the season have exhibited the greatest injury.

Results of spraying and dusting potatoes for late blight. L. C. CALLBECK. Two experiments with potato late blight fungicides were conducted in Prince Edward Island in 1948 on the Green Mountain variety. One was designed to study the relative fungicidal values and the effects on yield of eight spray materials; the other was designed to compare wet and dry applications of fungicides. Seven applications of the fungicides

were made and DDT was used in all mixtures. All plots were sprinkled several times in August with water suspensions of late blight spores. These disseminations coincided with periods of abundant moisture and a severe epiphytotic was built up.

The four copper sprays—Bordeaux (4-2-40), Bordow (8-40), C. O. C. S. Niatox (4-40), and Deecop (3-40)—were of approximately equal value in controlling the disease on the foliage, Bordeaux mixture and Bordow being but slightly superior to C. O. C. S. Niatox (4-40), and Deecop. Plots sprayed with Bordeaux mixture showed the least loss from late blight tuber rot. Control differences manifested by the four organic materials were great. Dithane (1 qt. + 0.5 lbs. zinc sulphate—0.25 lbs. lime — 40) was inferior to the copper fungicides. Fungicide 629 (1—40) was worthless, whereas Parzate (1—40) and Phygon XL (1—40) were superior to all materials. Phygon XL gave outstanding control of late blight but delayed maturity. Yields were as follows: C. O. C. S. Niatox 299.1; Bordow, 294.3; Parzate, 290.8; Bordeaux, 275.4; Dithane, 257.6; Deecop, 255.1; Phygon, 254.6; Fungicide 629, 210.4; and Check, 199.5 bushels per acre.

In the second experiment dusting and spraying were compared, the materials being (1) copper sulphate-lime, (2) copper oxychloride sulphate, (3) tetra copper calcium oxychloride. Losses from late blight tuber rot were: spraying 3.0 per acre, dusting, 5.4 per acre, check 6.4 per acre. Yields were: spraying, 255.0; dusting, 225.7; and check 129.1 bushels per acre.

The effect of incorporating 2, 4-D in the regular spray on the yield of white potatoes. N. K. Ellis. The growth substance 2,4-dichlorophenoxyacetic acid can be safely included in the regular potato spray under several conditions as reported by the author. 1. Spraying potato foliage did not decrease the value of the tubers for seed the following year. 2. Single applications of as much as 2.1 pounds per acre of acid did not depress yield when the plants were 15 inches taller or more. 3. The effect of the growth substance on several varieties and the effect of time of application on the yield will be discussed.

Conversion of potatoes to stable form. Roderick K. Eskew. The chief drawbacks to the industrial utilization of white potatoes are their great bulk and perishability. The Eastern Regional Research Laboratory has been engaged therefore in the development of cheap drying methods. One process involves grinding the raw, washed potatoes in a hammer mill and drying them in a steam tube drier. Some of the dried product is continuously recycled and mixed with the ground, raw potatoes to maintain the moisture content of the material going to

the drier at 45 per cent. This prevents sticking. The product is suitable for feed or fermentation. The total cost is estimated to be about $24.00 per ton of product. This includes everything except the cost of the potatoes and selling costs.

With the addition of a sulfur dioxide treatment and other slight modifications, this process can be used to produce potato flour at a cost of about $39.00 a ton.

Pressing the ground potatoes to reduce drying costs is not recommended because of loss of potato solids.

Direct heat rotary driers are not recommended for drying ground potatoes because of starch explosion hazards. Such driers may be used, however, for sliced, raw potatoes. The sticking problem is solved by coating the slices with dried potato meal.

Cooked potatoes may be dried on double drum driers of the type commonly found in distilleries by maintaining the temperature of the feed above 150° F. The produce is suitable for potato flour.

Aphid transmission of potato virus diseases in storage. A. A. GRANOVSKY. Potato aphids normally feed on growing plants, but not infrequently are found infesting tubers in storage. This proved to be an extremely serious phenomenon, especially important to seed potato and foundation stock production. In the last few years several lots of tubers were found to be aphid-infested in storage. When planted in the greenhouse and in the field, they produced a high percentage of diseased plants, with a colony of *Myzus persicae,* which previously had fed on the leafroll infected potato plant in the greenhouse. Tubers from both lots were planted in the green house and in the field. Potatoes from uninfested lots were free from virus diseases, whereas the aphid-infested tubers produced 87 per cent of diseased plants with leafroll. It is apparent that if only a few virus diseased tubers are present in a bin, and become aphid-infested in storage, the aphids may disseminate the virus to the entire lot, thus the certified potatoes may show a high incidence of virus disease in the field the following year despite the most rigid certification measures.

Response of potatoes to rates and placement of nitrogen in Connecticut, 1948. ARTHUR HAWKINS. Nitrogen rate and placement tests were conducted with the co-operation of growers on five farms. In these experiments, plots 4 rows wide by 50 feet long were replicated six times in a Latin Square. The same amount of phosphorus and potash was applied in the row in each case, namely, 180 pounds per acre each of phosphoric acid and potash. The nitrogen application rates were 90, 120, 150 and 180 pounds per acre. Increased yields of potatoes were

obtained with each additional amount of nitrogen applied up to 150 pounds per acre at each of the five locations. These increases were not always significant. On three farms when more than 150 pounds of nitrogen were applied, decreased yields were obtained; that is, the use of 180 pounds of nitrogen resulted in less yield than when 150 pounds were applied.

At one location where Green Mountains were planted relatively early, and where the use of Dithane permitted the vines which had received higher applications of nitrogen to remain green relatively late in the season, the yields increased with increasing amounts of nitrogen up to 180 pounds per acre, the highest amount used.

In the comparisons of either 60 or 90 pounds of the nitrogen broadcast per acre and 90 in the row (with the phosphorus and potash), as compared with applying the corresponding total amount of either 150 or 180 pounds of nitrogen all in the row, there was no advantage in yields obtained from broadcasting part of the nitrogen fertilizer. In fact, on four of the five farms, decreased yields were obtained when part of the nitrogen was broadcast and harrowed in previous to planting as compared with yields obtained when the same amount of nitrogen was applied in the row.

Unusual variegations in the Sebago potato—Part II—Pathological aspects. R. W. HOUGAS and G. H. RIEMAN. Since the vine type of the double-russet Sebago was suggestive of the leaf-roll virus disease, preliminary studies were conducted to determine the possible presence of a tuber-borne virus. Mechanical inoculations, using the carborundum technique, to *Nicotiana glutinosa, N. rustica* and *N. tabacum* gave negative evidence. No transmission of the double-russet condition was obtained through approach grafts to white Sebago.

Scab resistance of the double-russet Sebago, under paired-row trials, was significantly greater than the variety, Russet Sebago, from which it arose. As previously reported, scab resistance of the Russet Sebago is significantly greater than white-skinned Sebago variety.

The effect of zinc-containing sprays and dusts on potatoes. WILLIAM G. HOYMAN. Extensive potato-fungicide experiments were started in the Red River Valley of North Dakota in 1946 to determine the effectiveness of various new fungicides in controlling the fungi causing early and late blights of potatoes. A triple lattice design, employing 6 replications, was used each year for arranging the 16 treatments. DDT was included with each fungicide and also applied to the check plot in 1948. Three year's results have shown that zinc-containing sprays and dusts increased the yields during the absence or presence of one or both of the above pathogens.

The Cobbler variety was used in 1948 and a 4-12-8 fertilizer applied at the rate of 440 pounds per acre. A trace of late blight occurred and early-blight infection was too light to observe the effect of the various materials. Dithane D-14, Parzate, Zinc Nitro-dithioacetate plus Filmfast, Tri-Basic-Nu-Z, Copper-Zinc Chromate, Tribasic Copper Sulphate and Zinc Sulphate applied the first 3 applications, the last 3 applications and during the entire season (6 applications) were used as sprays. The adjusted treatment means obtained from an analysis of variance showed the yield of each of the 8 zinc containing sprays was significant at the 1 per cent level . The dust treatments consisted of Zerlate, Z178, Parzate, Cuprocide, Tribasic Copper Sulphate, DDT, and DDT until the appearance of either bilght when Dithane D-14 was applied. The yield of Parzate was significant at the 1 per cent level while the yields of Zerlate and Z178 were each significant at the 5 per cent point. The 3 plots treated with only copper-containing fungicides did not have significant yields.

In addition to increasing the yields, the zinc-containing materials caused the vines to grow larger and remain green until frost. There was a difference, however, among the various zinc-containing sprays and dusts in this respect.

Some observations of the bunch-top (Purple-Top) disease in Canada. D. J. MACLEOD. The bunch-top (purple-top) disease found in Canada is caused by a virus which does not correspond to the type strains of the aster yellows virus and is either an aberrant strain of it or an entirely different virus. Attempts to transmit this disease by means of the leaf-hopper *Macrosteles divisus* Uhl. have been unsuccessful. The bunch-top virus was repeatedly transmitted by stem grafting from potato to potato, tomato and five other Solanum species, in all of which it produced characteristic symptoms. The tomato was found to be a useful host for expressing the virus and perpetuating it under greenhouse conditions. In potato, there is considerable variation in the symptoms expressed by this virus. Certain varieties exhibit a yellowing or purpling of the leaves and stems associated with the stunting, leaf rolling, aerial tuber formation, and wilting symptoms. In other varieties and seedlings there is no definite coloration effect excepting a slight chlorosis of the leaves in the apical region of the plant. The virus is tuber-borne but is rarely carried beyond the second generation following initial infection. Frequently only a part of the tuber is involved. Infected tubers become firm in storage and may not germinate for 12 to 30 months after detachment from the affected plants. These hard tubers sometimes remain intact in the soil during the entire growing season.

The bunch-top virus was found repeatedly in tubers and seed pieces which survived in this hardened condition in the soil. When these tubers are planted, some of the eyes fail to germinate, a few produce weak, spindling sprouts which collapse in a few days, whereas others give rise to dwarfed stalks, with enlarged nodes and axillary shoots with swollen bases which may form aerial tubers. There is also an upward rolling of the leaflets, accompanied by a yellowing and purpling of the margins, especially in the region nearest the petiole. These dwarfed stalks are rigid and brittle and sometimes remain alive from 4 to 8 weeks. More frequently, however, these stalks wilt and die in 10 to 20 days following emergence. This secondary phase of the disease resembles the condition described as 'haywire'. Wilting plants generally show a necrosis of the vascular and cortical elements in the base of the stem, the stolons and the roots. The bases of these stalks usually disintegrate and exhibit a dark brown or black discoloration somewhat resembling that associated with the blackleg disease. When the bunch-top virus was introduced by grafting to Green Mountain already bearing the leaf roll virus, a severe form of bunch-top was produced. The tubers on the plants bearing both viruses show a necrosis of the vascular elements in the stolon end of the tuber, resembling net necrosis. The flesh of the tuber in the region showing this necrosis exhibits a greenish-blue fluorescence under ultra-violet light similar to that characteristic of the compound known as scopoletin. The bunch-top virus and the leaf roll virus were found in combination in plants manifesting severe bunch-top symptoms under field conditions. The bunch-top virus was also identified as the cause of a disease in field-grown tomatoes characterized by a dwarfing and rigidity of the plant and a rolling and purpling of the leaves. The virus found in tomato induced the typical symptoms of the bunch-top disease when it was introduced by stem grafting to susceptible potatoes.

Experiences with aerial application of insecticides and fungicides. JOSEPH P. MCKENNA. The relative merits of aerial application of insecticides and fungicides as compared with ground methods is a highly controversial subject. It is not the purpose of this discussion to sustain the arguments in favor of this method, but rather to present a brief resumé of the modifying factors which affect the efficiency of aerial application and in the light of our experience, endeavor to explain the causes for poor and inefficient control.

Consideration of the physical qualities of dusts used in aerial application.

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sary for an efficient aerial application service and a study of various diluents, dusts and sprays used in this work.

Potato blight investigations. W. R. MILLS and L. C. PETERSON. Infection has been observed on many seedlings including most of the recently named varieties which previously had been considered as immune, under conditions favorable for the development of blight late in the growing season. Several new races of *Phytophtora infestans* (Mont.) de Bary, on the basis of pathogenicity, have been isolated from such plants. These new races have been found only in plots concerned with the development of varieties resistant to blight. Some of these races may be produced experimentally under greenhouse conditions. Many seedlings, if inoculated at weekly intervals with the prevalent field culture, give an immune reaction throughout their life, whereas some seedlings exhibit signs of infection beginning at the 70th day. Infection usually appears first as specks, sometimes on old leaves and at other times rather generally. Virulent cultures are obtained by culturing the organism from some of the largest lesions and by repeating the inoculations on the plant in question.

The immunity of *Solanum demissum* to all known races of *P. infestans* has been confirmed. It has been demonstrated that several genes are concerned in resistance to *P. infestans.*

Field tests of fungicide-insecticide combinations in Michigan for 1948. J. H. MUNCIE and W. F. MOROFSKY. Field trials of 21 commination fungicide-insecticide sprays and 11 dusts were carried on at the Lake City Experiment Station.

In the spray plots best control of early blight was obtained by use of copper-zinc chromate. Zerlate, Dithane D-14, Yellow Cuprocide and Cuprous oxide ranked in control in descending order among the five best materials.

Highest yield was obtained from plots sprayed with Zerlate plus CM150 (DDT) followed in descending order by Zinc nitrodithioacetate, Dithane D-14 plus zinc sulfate and lime, Parzate, micronized copper oxide (Calumet & Hecla Co.) and Dithane Z-78.

In the dust plots best control of early blight was obtained with Zerlate closely followed in descending order by Tribasic copper sulfate, zinc nitrodithioacetate and Dithane Z-78, Yellow Cuprocide, and copper-zinc nitrodithioacetate.

There were no significant differences in yield, but the highest yield in dust plots was obtained from copper-zinc nitrodithioacetate followed in descending order by Tribasic copper sulfate, Zinc nitrodithioacetate, Zerlate and Dithane Z-78.

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In another field of mixed varieties, using three dust materials, control of early blight was best with copper-zinc chromate followed by copper 8 quinolinolate and Tribasic copper sulfate.

Insect counts were made 2-4-6-8 days after each application from the 11th of July to the 9th of September.

All the spray and dust combinations gave from 95-100 per cent control of potato flea beetles. Control of aphids varied from 70-100 per cent in the spray plots, and from 69-95 per cent in the dust plots with Parathion giving the best control. Although none of the materials gave a 100 per cent control of potato leafhoppers, six-spotted leaf hoppers, spittle bugs or tarnished plant bugs, there were indications that the higher concentrations of DDT did give better results, especially on the six-spotted leafhoppers. Neither potato leafhoppers nor the Colorado potato beetles presented any serious problem during these tests.

Reaction of hybrid potato varieties to infection by Fusarium Eumartii. J. H. MUNCIE. In greenhouse trials in soil infested with *Fusarium eumartii,* of 25 hybrid seedling selections and 7 commercial varieties, only Katahdin failed to show foliage symptoms of the disease. A selection of the cross Chippewa x Menominee showed only very slight foliage symptoms. In field trials on heavily infested soil employing 24 hybrid selections and 15 commercial varieties, the Teton showed least tuber infection. Unnamed hybrid selections from the crosses 627-618 x Ostragis and Hindenburg x Katahdin, seedling 627-126 (U.S.D.A.) and Menominee showed tuber infection ranging from 11 to 20 per cent. Most of the seedling selections and commercial varieties showed tuber infection ranging from 21 to 40 per cent, whereas one seedling showed 100 per cent tuber infection.

The comparative efficiency of tuber indexing and tuber planting in the elimination of virus diseases from seed potatoes. L. T. RICHARDSON AND H. N. RACICOT. Starting with a quantity of Prince Edward Island Green Mountain seed potatoes, Certified grade, 1000 tubers were tuber indexed in the greenhouse during the winter of 1943-'44, and the healthy ones planted by tuber-unit in the field next spring. A similar 1000 tubers were planted in the field, without indexing, by tuber units (4 plants to a unit). The two plots were separated only by 3 rows of corn. Records of all viroses were taken, and the diseased plants removed as soon as possible, in both greenhouse and field. When the plots were harvested, one tuber from each plant of the remaining units was retained for the following year's experiments. During the winter, 1000 tubers from the progeny of the indexed plot were tuber indexed in the

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greenhouse, and the healthy ones planted by tuber units in the field the next spring. One thousand tubers from the progeny of the tuber unit plot were planted by tuber units, but without indexing, in the field the next season. This procedure was repeated 5 times. The percentage of virus diseases eliminated by tuber indexing in the greenhouse each year was 1.8, 4.5, 7.5, 2.2 and 1.4. The percentage of virus diseases occurring in the resulting healthy stock growing in the field each year was 1.6, 1.0, 1.5, 0.6, and 2.6. The percentage of virus diseases occurring in the tuber unit plot each year was 2.7, 3.9, 29.9, 8.9, and 16.4. Under Ottawa conditions, tuber indexing was more efficient in eliminating virus diseases than tuber unit planting.

Utilization of potatoes. Production of useful fermentation products. R. H. TREADWAY AND T. C. CORDON. Two-thirds to three-fourths of the solids content of the potato is starch, which can be converted to the sugars maltose and dextrose. These sugars may in turn be fermented to produce a series of alcohols, acids, and other organic compounds or may be used for the production of protein by propagation of feed yeast.

In the last few years, a large quantity of surplus potatoes has gone into the production of ethyl and butyl alcohols. With the object of extending the list of compounds which can be produced from potatoes, an investigation was made of their use in lactic acid fermentation. Lactic acid is at present made in the United States by fermentation of starch hydrolyzates, dextrose, lactose, or sirups. The acid, which is currently manufactured at the rate of approximately 6 million pounds a year, promises to become a large-tonnage chemical because of important existing and potential uses.

In preparing lactic acid, the potatoes were washed, ground, and then thoroughly cooked. The starch in the cooked potato was converted to sugars with amylase produced by the mold *Aspergillus niger*. Three strains of *Lactobacillus* were used in the fermentation, the best results being obtained with a strain of *L. pentosus*. Although it is common practice in commercial manufacture of lactic acid to use added nutrients, yields of 80 to 90 per cent lactic acid (based on the available carbohydrate) were obtained in the fermented mash without added nutrients. About 85 per cent of the acid in the mash could be recovered as methyl lactate. Potato mash was used as the culturing medium for the amylase-producing mold and for the *Lactobacillus*, as well as for supplying carbohydrate for the fermentation.

Preliminary studies indicate that feed yeast can be propagated on potatoes. The yeast uses carbohydrate and nitrogen to produce cell protein. The nitrogen is added as ammonia, ammonium salts, or urea.

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Unusual variegations in the Sebago potato.—Part I—Somatic mutations. W. H. WEBSTER AND G. H. RIEMAN. A clonal line of the Sebago potato variety grown since 1943, has exhibited a high degree of instability. Three different types of tuber russeting and two abnormal vine characters have arisen which can be propagated asexually.

The abnormal vine type, producing double russeting of the tubers, resembles to some extent the symptoms of a potato plant infected with the virus causing leaf-roll.

Reversion of the abnormal vine types to normal occurs frequently and is always accompanied by a change to single russeting of the tubers.

Effect of the leaf roll and X viruses on stand and yield of potatoes. R. E. WILKINSON AND F. M. BLODGETT. Replicated factorial experiments designed to determine the effect of the leaf roll and X viruses in Katahdin, Chippewa, and Sebago varieties of potatoes were planted in 1947. The virus diseases were present as the result of natural infection. All tubers came from the same field the previous year, were stored under the same conditions, and were indexed in the greenhouse during the winter for the presence of virus diseases.

The Katahdin and Chippewa plots had 90 per cent of a full stand and the missing hills were scattered at random. The principal effect of the virus diseases appeared in the yield. The virus-free plots produced a yield of 365 bushels per acre. The X virus in the absence of leafroll caused a reduction of 23 bushels per acre, but in the presence of leafroll of 74 bushels per acre; whereas leafroll gave a reduction of 95 bushels in the absence of X virus disease and of 146 bushels in the presence of X virus; or, both diseases together gave a reduction of 169 bushels per acre. With the exception of the reduction due to X disease in the absence of leafroll, these reductions are highly significant and the interaction between the two diseases is also significant.

In the Sebago variety, in addition to an effect on yields, there was a marked effect on the stands. From the 60 seed pieces planted in each, 40 hills grew from healthy sets; 20 from those with X virus; 34 from those affected with leafroll; and 13 from the sets affected with both X and leafroll viruses.

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SECTIONAL NOTES

Alabama

The commercial potato section of Alabama has planted 245 cars of seed. Baldwin County planted 200 and Escambia County some 45 cars. Despite the seemingly lack of interest in potatoes during the winter, this planting is at least 50 cars more than expected earlier. Last year there were more than 300 cars planted in the two counties so we have a reduction of nearly 20 per cent in our total planting. Our estimate varying between 13,000 and 13,500 acres will not be so far from the total number of acres planted. That compares with about 16,000 acres for last year. Of this planting more than 70 per cent will be Bliss Triumph and the balance Sebago.

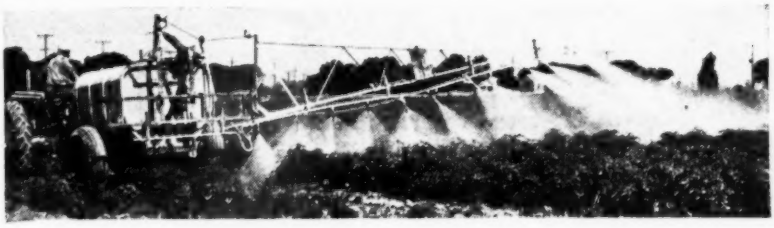
We have had a peculiar weather condition this winter. In fact, we have had very little winter at all. During the month of February the temperature did not reach the freezing point. Because of this condition we have potatoes anywhere from just emerging to those with small potatoes. Today, the 1st of March, we missed a frost by a few degrees but there is considerable worry over probable frost damage at a later date. So far this season we have missed the heavy rains that leach our fertilizer, but March weather is usually bad with us in this respect.

The papers have announced a support price of $2.00 per hundred for all grades of potatoes this season. That is graded and in car. That means that our farmers will probably get about $1.50 per 100 pound sack if support has to be used. We are always hoping that we can move the crop above support. Most of our growers should be able to secure small profit at this price but there will be no getting rich. We must expect for things to get back to normal sooner or later and take the good with the bad.—Frank E. Garret

Maine

Maine potato farmers took a straight 23.6 per cent reduction in acreage from their 1948 goal. This policy was determined by the P. and M. A. Committee and Aroostook farmers have just received their allotments. There is some grumbling but on the whole farmers have realized the situation and are apparently going along with the program. Maine has always participated better than 90 per cent in such programs and there is nothing now which would indicate that they will not go along at that same ratio.

This acreage cut brings Maine back to their 1942 potato acreage. Any further cut another year will apparently meet much resistance.



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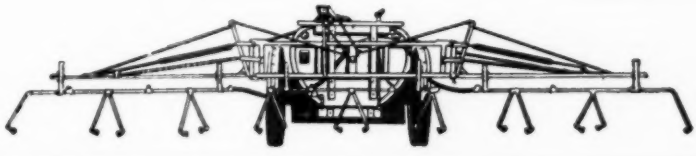

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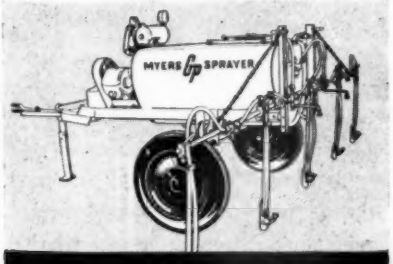

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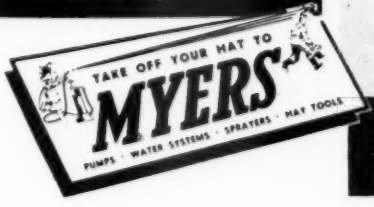

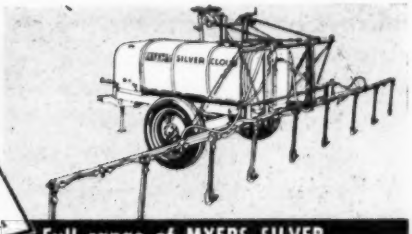

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To date (March 7th) Maine has shipped 40,700 of which the government has purchased 26,562 cars. Because some of these cars were loaded heavily last fall it would be the equivalent of well over 30,000 cars purchased by the government.

The industry is up in arms about Canadian imports as much of the Canadian stock competes with Maine markets. Farmers cannot understand why the government allows Canadian potatoes to enter, for the U. S. is under a price support program with acreage control. Canada has no such program so the U. S. is really supporting the price of Canadian potatoes.

Hundreds of letters from all over the country have been recently received from the Kennebecs. Practically all of the Kennebecs were in the hands of the State Seed Board. These have been allocated in small lots to some of the better growers who have excellent records as seed growers. These will be multiplied under very careful supervision this year. The State Department of Agriculture and the Extension Service are again promoting a Blue Tag Certified Seed Campaign to have every one plant certified seed in 1949. A new colored poster is being placed in potato houses throughout the county so that farmers will constantly be aware of the fact that certified seed last year outyielded table stock by 44 bushels per acre. Last year 85 per cent of all the potato acreage was planted with certified seed. It will be difficult to exceed this but every effort will be made to do so. Plans are being made for the Farm Bureau Field Day at the Experiment Station, Presque Isle for the 10th of August, 1949.

—Verne C. Beverly.

New Jersey

Many growers in New Jersey are still undecided in regard to the acreage of potatoes that they will plant this year. Some growers feel that they cannot produce potatoes on the small acreage allotted and have decided to take a chance on good prices and plant their normal acreage. Others have decided not to overplant because of the danger of market prices being considerably below the cost of production and still others have decided not to grow any potatoes this year.

Weighing these possible actions, indications are that slightly fewer growers will comply with the goals recently released as compared with goals released in 1948.

Preliminary indications to plant released by the State Department of Agriculture are set at 43,000 acres whereas 54,000 acres were planted last year.

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We have had a very mild winter and growers are now cutting seed and getting their fertilizer in order to be ready to plant at the earliest possible date. Some growers like to start by the 17th of March but large scale planting is not likely to start before the 1st of April.

There is considerable interest in methods of increasing yields and some of our growers are planning on closer seed spacing, and fertilizer side dressing as a means of accomplishing this end.—JOHN C. CAMPBELL

NEW YORK

Marketing agreements are receiving a lot of attention in both up-state and Long Island. The Long Island growers have had several meetings on agreements for their territory with no definite action, more than the appointment of committees to study the matter further.

In up-state New York, the directors of the Empire State Potato Club, the State Farm Bureau Federation Potato Committee and the P. & M. A. Potato Committee have been delegated with the responsibility to draw up a Marketing Agreement that would fit New York and submit it to the growers through meetings *etc.* after the committee has agreed upon a plan.

The new Support One Price Program is regarded as a big help in instituting Marketing Agreements. The two objections to Marketing Agreements have been disposition of the low grades and the enforcement. With an outlet for low grades, enforcement will be much easier.

Acreage cuts of approximately 20 per cent have been indicated for up-state growers and about 30 per cent for Long Island. The Long Island allotments may be issued but on the 1st of March the up-state allotments had not been announced and many growers are much in doubt about their acreage. However, the tendency is to go along with the program because our growers realize that potatoes have gotten to be a problem which must be handled with considerable thought and consideration from all standpoints. They recognize too that the individual program must be a part of a larger program for the benefit of all.

Markets vary from fair to steady with prices somewhat below support generally. With local markets our growers are attempting to market a good percentage of their crop themselves with a minimum of outside help. However, the government is getting plenty of potatoes. —W. H. EVANS

NORTH CAROLINA

As a result of unseasonably warm weather, Irish potato growers in eastern North Carolina began planting their crop in early February. A number of growers in the Beaufort and New Bern areas completed

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their plantings about the 20th of February. The rainy period during the latter part of the month has slowed plantings in other areas. By far the largest proportion of the acreage will be planted with the Irish Cobbler variety. Small plantings of Katahdin and Sebago will be planted in some areas.

The North Carolina potato acreage for 1949 was cut 25 per cent below that allotted for 1948. The allotted acreage for 1948 is 20,500 acres. At a meeting of the eastern North Carolina potato growers on the 12th of February in Washington, N. C., growers expressed views favoring an across-the-board cut for all potato growing sections of the country; *i.e.*, if one area is cut 20 per cent or more, all areas should be cut the same. Also, they maintained that the support price should be uniform for all areas for a given period. Opposition was expressed toward the 20 cent differential in the support price during June between North Carolina and other areas sending potatoes to the market during that month. Under the present provisions of the program, North Carolina will receive $1.70 per 100 pounds in June whereas during the same period competing areas will receive $1.90.

It is expected that a greater number of precooled cars of potatoes will be shipped out of North Carolina this year than in previous years. With an increase in the number of washing machines being installed in the eastern potato growing area of North Carolina, a higher percentage of the crop will be washed in 1949. In an effort to improve the handling of potatoes during harvesting, grading and preparation for shipment, schools are to be conducted in twelve localities in the eastern potato areas of the state.

Potato planting proceeded from the 28th of January to completion in mid-February under the best weather conditions on record. The temperatures remained above normal until the 1st of March at which time 20 to 25 per cent of the plants had begun to emerge. The low temperatures during the first three days of March cut down most of these small plants except for plantings that were adjacent to the rivers and ocean. This should not prove any great factor as there is still plenty of time for these plants to make a normal growth and produce a good yield.

With the advent of washing machines in this area the variety picture has changed radically. The Cobbler variety has dropped from 85 to 90 per cent of the acreage; 10 years ago to 35 per cent; 2 years ago and on to approximately 12 per cent. Practically all this is planted in outlying areas where washers are not available. Red Bliss and Pontiac acreages total about 12 to 15 per cent, with greater acreages

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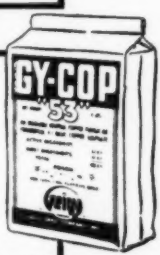

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of Bliss because this variety washes better than Pontiac. The Katahdin acreage increased gradually up to last year when it occupied about one-third of the plantings but it has dropped to approximately 25 per cent this year, largely because it does not wash so well as Sebago. Because of its shape, color, freedom from browning *etc.* which result in such an excellent washed product, Sebago plantings have increased from insignificance five years ago to at least 50 per cent of the state acreage this year and in the area adjacent to the washers it occupies nearly three-fourths of the plantings.

Growers gladly reduced the acreage in accordance with this allotment and until recently were pessimistic about the prospects of making any profit on the crop. Unfavorable weather conditions in other parts of the country have lifted their hopes somewhat and interest in controlling insects and diseases and washing and marketing problems have increased greatly during the past few days.—W. C. BARNES

TEXAS

This section suffered a severe freeze on the 31st of January which caused much damage to the potato crop. We estimate that approximately 15 per cent of the crop was almost a total loss; about 70 per cent will make about half a normal crop, and approximately 15 per cent of the late plantings have suffered no damage.

This county has not entered into a marketing agreement. The new support program has met with much favor. As a result the top grades, will go to consumers and the lower grades into conversion channels.—CLEVE H. TANDY

CANADA

Following an exceedingly large crop of potatoes in Eastern Canada, many bushels of both table stock and seed were shipped to the United States. The United States Government feeling that their markets might be flooded and their suppo[illegible]rogram disrupted, asked Canadian Government officials to discus[illegible] matter with them. After negotiations between the Governments o[illegible]nada and the United States, relative to the movement of potatoes, the following agreement was reached:

1. That, after the 1st of December and applying to the 1948 potato crop, Canada would not ship any table potatoes to the United States.

2. Certified seed potatoes would be shipped to the United States only under permit and on the time basis; that is, permits would be issued for potatoes going from Canada to the United States only a short time before the planting date in the area to which the potato[illegible] were

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destined. This control of the potato movement has worked out very satisfactorily to all concerned, and Canada is continuing to move quantities of certified seed into the markets they have been serving for many years. Permits have been rendered freely when the shipper attaches a statement to his application to the effect that these potatoes would not be diverted or reassigned for table purposes.

At the same time that the agreement was made with the United States, the Canadian Government issued a price support program for Canadian growers in Prince Edward Island and certain large commercial shipping centres in New Brunswick. The Canadian Government has agreed to pay $1.15 per cwt. for Canada No. 1 (table) potatoes in the bin on the farm as of the 1st of April, 1949. Although some growers have felt that this support price is rather low, many growers feel quite satisfied, as the price of potatoes at present is slightly higher than the government offers, and, at the same time, the potatoes are moving freely.—J. W. SCANNELL

ERRATUM

The illustration on page 49 of the February, 1949 issue was inserted by mistake.